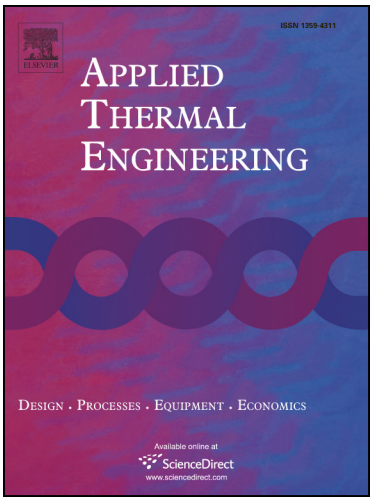

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Abstract:

The current experimental investigation deals with the thermo-physical attributes of Cu-Zn-Al LDH nanofluid its use in high temperature steel cooling. Here, authors used three metals (Copper, Aluminium, and Zinc) having high thermal conductivity to synthesize a brand new nanofluid for heat transfer application. Authors have achieved moderate increment (13.9%) in thermal conductivity value compared to water. A section of this work also aims to maximize the cooling rate which aids in improving mechanical properties of quenched steel plate. The maximum cooling rate of 158.4^{o}C/sec was attained at 160 ppm of nanofluid concentration which is 18.5% higher than that attained by water. In addition to enhanced thermal conductivity, nanoparticle deposition on the cooling surface also contributes to the heat transfer enhancement by providing additional nucleation site. It is also to be considered that above an optimum nanofluid concentration both thermal conductivity and cooling rate values decline. Such trend is owed to several factors namely poor suspension stability, high agglomeration tendency and formation of nanoparticle layer on steel surface which prevents contact between coolant and surface.

Keywords: Cu-Zn-Al LDH, nanofluid, spray cooling, thermal conductivity, cooling rate, average heat flux.